MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
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SRM Number: 3154
MSDS Number: 3154
SRM Name: Sulfur Standard Solution

Date of Issue: 20 July 2006

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

Description: This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of sulfur. One unit of SRM 3154 consists of five 10-mL sealed borosilicate glass ampoules of a solution containing a known mass fraction of sulfur and a sulfuric acid volume fraction of approximately 0.1 %.

Substance: Sulfuric Acid

Other Designations: Hydrogen sulfate, dihydrogen sulfate, sulphuric acid, dithionic acid, oil of vitriol, dipping acid, mattling acid, battery acid.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component:	Sulfuric Acid
CAS Number:	7664-93-9
EC Number (EINECS):	231-639-5
Nominal Mass Fraction (%):	0.1
EC Classification:	C (Corrosive)
EC Risk:	R35 (causes severe burns) R45 (may cause cancer)
EC Safety:	S26 (in case of eye contact, rinse immediately and seek medical advice) S28 (in case of skin contact, wash immediately) S45 (in case of accident or illness, see doctor; show label)

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0-4): Health = 3 Fire = 1 Reactivity = 2

Major Health Hazards: Sulfuric acid at higher concentrations can cause severe injury or death if inhaled, swallowed, or absorbed through the skin. Chronic exposure to mist may cause cancer.

Physical Hazards: Contact with metals may release explosive hydrogen gas. Mechanical damage or mishandling may break or shatter glass container.

Potential Health Effects

Inhalation: Sulfuric acid is extremely destructive to the mucous membranes and respiratory tract. Inhalation may cause spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, pulmonary edema, and death. Symptoms of exposure may include burning sensation, cough, laryngitis, shortness of breath, headache, nausea, and vomiting. Chronic exposure may damage teeth, perforate the nasal septum, cause chronic bronchitis and nasal congestion, and/or increase the risk of cancer of the larynx.

Skin Contact: This material is corrosive and can cause severe burns with redness and pain. If burns are extensive, circulatory collapse and death may result.

Eye Contact: This material can cause severe eye damage and possible blindness. Chronic exposure to mist may cause conjunctivitis.

Ingestion: Sulfuric acid is extremely destructive to the GI tract. Symptoms may include sore throat, abdominal pain, vomiting, and diarrhea, followed by circulatory collapse. Death may result.

Medical Conditions Aggravated by Exposure: Pre-existing disorders of the respiratory tract, GI tract, skin, eyes, or other target organs.

Listed as a Carcinogen/ Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	X	
In the International Agency for Research on Cancer (IARC) Monographs	X	
By the Occupational Safety and Health Administration (OSHA)	X	

Note: Chronic exposure to sulfuric acid contained in strong inorganic acid mist is known to cause cancer.

4. FIRST AID MEASURES

Inhalation: Move the person to fresh air immediately. If not breathing, qualified personnel may start CPR or give oxygen if necessary. Get medical aid at once, and bring the container or label.

Skin Contact: Immediately remove contaminated clothing and shoes, then flush affected skin with water for at least 15 minutes. Wash thoroughly with soap and water. If burns are severe or if skin irritation persists, get medical aid and bring the container or label. Wash contaminated clothing before reusing.

Eye Contact: Immediate first aid is required. Remove contact lenses (if any). Do not allow victim to rub eyes or keep eyes closed. Flush eyes with large amounts of running water for at least 30 minutes, keeping eyelids open and raising lids to remove all chemical. Get medical aid at once, and bring the container or label.

Ingestion: Contact a poison control center immediately for instructions. Wash out mouth with water, but do not induce vomiting. Get medical aid at once, and bring the container or label.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Sulfuric acid is not flammable, but it is an oxidizing agent that can react with combustible materials to cause fires. It may also react with metals to release explosive hydrogen gas.

Extinguishing Media: Use extinguishing media appropriate to the surrounding fire: carbon dioxide, dry chemical, or foam. Use water spray from a distance to dilute sulfuric acid and to absorb products of combustion. Sulfuric acid may react with water to produce heat.

Fire Fighting: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): N/A, not flammable

Autoignition (°C): N/A

Lower Explosive Limit (LEL): N/A

Upper Explosive Limit (UEL): N/A

Flammability Class (OSHA): N/A

Products of Combustion: Thermal decomposition of this material may release toxic oxides of sulfur.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Notify safety personnel of spills. Evacuate nonessential personnel and ventilate the spill area. Surfaces contaminated with this material should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Disposal: Refer to Section 13, Disposal Considerations.

7. HANDLING AND STORAGE

Storage: Store unopened containers of this material in a dry place at room temperature. Protect from physical damage, heat, and light, and isolate from incompatible materials.

Safe Handling Precautions: Wear gloves, chemical safety goggles, and a respirator if necessary (Section 8). If contact with this material occurs, wash immediately or change clothing as required (Section 4). Use only in a well-ventilated area. Engineering controls should maintain airborne concentrations below TLV (Section 8).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:

OSHA PEL: 1 mg/m^3
ACGIH TLV-TWA: 1 mg/m^3
UK OEL: 1 mg/m^3

Ventilation: Use local or general exhaust to keep employee exposures below limits. Local exhaust ventilation is preferred because it can control contaminant emissions at the source, preventing dispersion into the general work area. Refer to the ACGIH document *Industrial Ventilation, a Manual of Recommended Practices*.

Respirator: If necessary, refer to the NIOSH document *Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84* for selection and use of respirators certified by NIOSH.

Eye Protection: Use chemical safety goggles where dusting or splashing of solutions may occur. See OSHA standard (29 CFR 1910.133) or European Standard EN166. The employer should provide an emergency eye wash fountain and safety shower in the immediate work area.

Personal Protection: Wear appropriate gloves and protective clothing to prevent contact with skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component: Sulfuric Acid

Appearance and Odor: Dense, hygroscopic, oily liquid, colorless to brown; no odor

Relative Molecular Weight: 98.07

Molecular Formula: H_2SO_4

Density (g/cm^3): 1.84

Solvent Solubility: Decomposes in alcohol

Water Solubility: Soluble

Boiling Point (°C): 290 (554ºF), varies according to concentration

Melting Point (°C): Varies according to concentration

Vapor Pressure (Pa): Negligible

Vapor Density (Air = 1): N/A

pH: N/A

10. STABILITY AND REACTIVITY

Stability: __X__ Stable _____Unstable

Stable at normal temperature and pressure.

Conditions to Avoid: Contact with incompatible materials.

Incompatible Materials: Rubber, plastics, and other coatings; combustible materials, halocarbons, carbonates, oxidizing materials, amines, bases, halogens, metal carbides, acids, metal salts, peroxides, and reducing agents; cyanides (releases hydrogen cyanide), sulfides (releases hydrogen sulfide), metals (releases hydrogen gas)

Fire/Explosion Information: See Section 5.

Hazardous Decomposition: Thermal decomposition of this material may release toxic oxides of sulfur. See also Incompatible Materials.

Hazardous Polymerization: _____ Will Occur __X__ Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: __X__ Inhalation __X__ Skin __X__ Ingestion

Toxicity Data:

Human, oral (LD_{Lo}): 135 mg/kg
Rat, oral (LD_{50}): 2140 mg/kg
Rat, inhalation (LC_{50}): 510 mg/m^3 (2 hrs)

Target Organ(s): Respiratory tract, skin, eyes, GI tract.

Mutagen/Teratogen: Sulfuric acid has caused mutagens in cell cultures, and has been investigated as a possible reproductive effector.

Health Effects: See Section 3.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

Western mosquitofish (*Gambusia affinis*): LC_{50} (24 hrs) = 42,000 µg/L
Cockle (*Cerastoderma edule*): LC_{50} (48 hrs) = 200,000 µg/L
Sand shrimp (*Crangon crangon*): LC_{50} (48 hrs) = 70,000 µg/L

Environmental Summary: Sulfuric acid is toxic to aquatic organisms. When released to soil, it may leach into groundwater.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of container and unused contents in accordance with federal, state, and local requirements for acid waste, which vary according to location. Decontaminate containers before recycling. Processing, use, or contamination of this product may change the waste management options.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Sulfuric Acid Solution, Hazard Class 8, UN2796, Packing Group II

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4): RQ = 1000 lbs.

SARA Title III Section 302: TPQ = 1000 lbs.

SARA Title III Section 304: RQ = 1000 lbs.

SARA Title III Section 313: Regulated in aerosol form only

OSHA Process Safety (29 CFR 1910.119): Not regulated

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	Yes
CHRONIC:	Yes
FIRE:	No
REACTIVE:	Yes
SUDDEN RELEASE:	No

STATE REGULATIONS

California Proposition 65: Regulated as "Strong inorganic acid mists containing sulfuric acid."

CANADIAN REGULATIONS

WHMIS Classification: C (oxidizing material), D1A (very toxic material), E (corrosive material)

WHMIS Ingredient Disclosure List: Regulated

CEPA Domestic Substances List (DSL): Regulated

EUROPEAN REGULATIONS

EU/EC Classification: C (Corrosive)

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): Listed

TSCA 12(b), Export Notification: Not listed

16. OTHER INFORMATION

Sources:

IUCLID Chemical Data Sheet: Sulphuric Acid. 19 February 2000.

PAN Pesticides Database: Sulfuric Acid.

Registry of Toxic Effects of Chemical Substances (RTECS): WS5600000, Sulfuric Acid.

U.S. National Institute for Occupational Safety and Health, *NIOSH Pocket Guide to Chemical Hazards*, September 2005 edition. DHHS (NIOSH) Publication No. 2005-151.